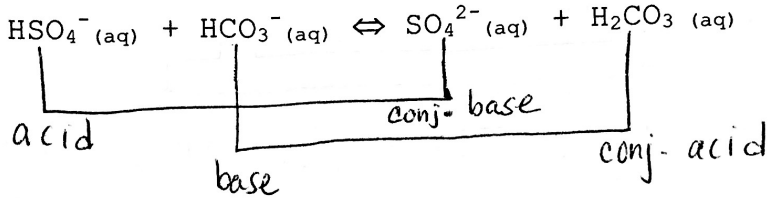
CHM129
Acid-Base Equilibrium

1. Identify the acid, base, conjugate acid and conjugate base in the following reaction:



2. Calculate the $[OH^-]$ at 25 °C for a solution with $[H_3O^+]=7.5\times10^{-5}$ M. Determine whether the solution is acidic, basic or neutral.

$$[H_3O^+][OH^-] = 1.0\times10^{-14}$$

$$[OH^-] = \frac{1.0\times10^{-14}}{[H_3O^+]} = \frac{1.0\times10^{-14}}{7.5\times10^{-5}} = 1.3\times10^{-10}$$

$[H_3O^+] > [OH^-]$ Acidic Solution

3. Complete the following table (show your work):

pH	pOH	$[H^+]$ $[H_3O^+]$	$[OH^-]$	Acidic or Basic
2.12	11.88	7.5×10^{-3} M	1.3×10^{-12} M	Acidic
8.30	5.70	5.0×10^{-9} M	2.0×10^{-6} M	Basic
12.11	1.89	7.8×10^{-13} M	1.3×10^{-2} M	Basic

4. (a) Calculate the pH of a solution containing 0.425g HNO_3 in 2.00L of solution.

$$0.425\text{ g } HNO_3 \left(\frac{1\text{ mol } HNO_3}{63.02\text{ g } HNO_3}\right) = 6.74 \times 10^{-3}\text{ mol } HNO_3$$

$$[HNO_3] = \frac{6.74 \times 10^{-3}\text{ mol}}{2.00\text{ L}} = 3.37 \times 10^{-3}\text{ M} = [H_3O^+]$$ strong acid

$$pH = -\log [H_3O^+] = -\log(3.37 \times 10^{-3}) = \underline{2.472}$$

(b) Calculate the concentration of an aqueous solution of $Ba(OH)_2$ that has a pH of 12.05.

$$[OH^-] = 10^{-pOH} = 10^{-1.95} = 1.1 \times 10^{-2}\text{ M}$$

$$pOH = 14.00 - pH = 14.00 - 12.05 = 1.95$$

$$[OH^-] = \#OH^- \times [\text{Base}] \quad \text{for strong base}$$

$$[\text{Base}] = \frac{[OH^-]}{\#OH^-} = \frac{1.1 \times 10^{-2}\text{ M}}{2} = \underline{5.6 \times 10^{-3}\text{ M}}$$